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January 25, 1996

By Federal Express

Nancy-Ellen Zusman, Esq.
U.S. EPA, Region 5
CM-29A
77 West Jackson Boulevard
Chicago, Illinois 60604

Re: Lindsay Light II Site, 316 East Illinois St.
Chicago, Illinois

Dear Nancy-Ellen:

When we recently spoke, I indicated that my clients were pleased with EPA's willingness to modify the schedules in the proposed AOC, but were concerned about EPA's response to certain of the other matters that were raised in my letter to you of November 2, 1995. In particular, I promised to provide you with further information concerning the statement in your letter of December 21, 1995, that EPA intends to establish concentration criteria for the uranium and thorium isotopes.

As your letter makes clear, EPA's plans are apparently based on its interpretation of certain data submitted by STS. EPA interprets the data to reflect the possibility that the Site might contain enriched uranium and that the thorium isotopic ratios are unexpected. I attach a memorandum from Dr. Garet E. Van De Steeg of Kerr-McGee that addresses these points. As you will see, EPA has seriously misconstrued the STS data.

As I am sure you know, the enrichment of uranium, a step in producing material for nuclear weapons, requires expensive and complicated equipment. The processes by which to enrich uranium were developed long after Lindsay Light had moved operations to West Chicago and, in any event, the details of these processes are classified under the Atomic Energy Act. As a result, it is almost inconceivable that enriched uranium could be found at the Site. As shown by the attached memorandum, if

the STS report is interpreted with an understanding to the limits of the measurement method, the data are fully consistent with the isotopic ratios of natural uranium. Moreover, the fact that the isotopic ratios of U-238 and U-234 are roughly equal shows that the uranium has not been enriched.

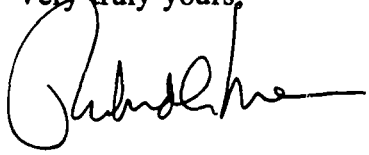
Your letter also asserts that the thorium ratios observed by STS are unexpected. This claim is also unfounded. As shown by the attached memorandum, the STS data are fully consistent with the expected ratios if the counting error is considered.

We are very concerned about your intention to supplement the radium cleanup criteria with as yet unspecified criteria for thorium and uranium isotopes. If the cleanup is proceed in an cost-efficient manner, it is necessary to establish a program for surveying and verification that allows expeditious measurement techniques. The imposition of needless concentration criteria for uranium and thorium would delay the cleanup because of the time that would be required for the necessary isotopic analyses. Moreover, the cost of the cleanup would increase because of the expense of these complicated measurements and, perhaps even more significant, because of the delay associated with the measurements.

In light of the above, we believe that the imposition of cleanup criteria for uranium and thorium isotopes would be arbitrary and capricious and otherwise not in accordance with law. We urge EPA to reconsider.

As it happens, Dr. Van De Steeg and Mr. J. Dan White will be in Chicago on January 31 (after 2 p.m.) through February 2, 1996, and would be available to meet with your technical experts to discuss the matter further. They would prefer to meet on Thursday, or, if that day is unavailable, on Friday. Please let me know if we should arrange a meeting.

Very truly yours,



Richard A. Meserve

Counsel for Kerr-McGee
Chemical Corporation

Enclosure

INTERNAL CORRESPONDENCE

Safety & Environmental Affairs (UNIT)	TO	Richard A. Meserve	DATE	January 24, 1996
	FROM	G. E. Van De Steeg Voice 3574 Fax 3967	SUBJECT	STS Tables 5a & 6: Uranium & Thorium Isotopic Ratios

MEMORANDUM

Re: Lindsay Light II Site -- Uranium and Thorium Isotopes

This memorandum concerns the assertion by EPA that the uranium and thorium isotopes measured by STS in Tables 5a and 6 do not reflect the expected isotopic relationship. Letter from Nancy-Ellen Zusman of 21 Dec 95 (page 3, item 11). EPA is incorrect in its interpretation of the STS tables.

URANIUM Table 5a

The uranium nuclides, or isotopes, are in their natural ratios.

U-235 Analysis

Alpha spectroscopy is one of two standard methods for analyses of environmental samples for trace amounts of actinides, such as uranium and thorium. (The other standard method for environmental actinide measurements is gamma spectroscopy.) For natural uranium, the count-rate of U-235 is only 4.60% of the count-rate of U-238 and only 4.60% of the count-rate of U-234. (That is, only 4.6 counts are collected from U-235 for every 100 counts collected from U-238 and for every 100 counts collected from U-234.) The analyst assumes that all counts in the region of each uranium peak are due to either U-238 (alpha energies range from 4.04 to 4.20 MeV), U-235 (alpha energies range from 4.15 to 4.60 MeV) or U-234 (alpha energies range from 4.60 to 4.78 MeV).[1/] Note that there is a mutual interference in that both U-238 and U-234 emit alphas in the same energy range as U-235: both U-238 and U-235 emit alphas in the range from 4.15 to 4.20 MeV and the upper alpha energy for U-235 (4.60 MeV) is the same as the lowest alpha energy for U-234.

The alpha spectrometer system used at Quanterra has a resolution ranging from 0.05 to 0.10

1/ Handbook of Chemistry and Physics, 71st Edition, CRC Press, 1990.

MeV.[2/] As a result of the resolution and interference limitations, the system cannot differentiate U-235 alphas from U-238 alphas around 4.15-4.20 MeV or differentiate U-235 alphas from U-234 alphas around 4.60 MeV. Because 97.8% of the uranium activity is from U-238 and U-234, when a few U-238 or U-234 alpha counts are attributed to U-235 (or a few U-235 alpha counts are assigned to U-238 or U-234), the loss (or gain) of the few alpha counts does not appreciable affect the calculated amounts of U-238 and U-234 present. However, when just a few U-238 or U-234 alpha counts are added to the small amount of U-235 alpha counts the calculated U-235 content is often doubled, tripled or even quadrupled.

The apparent U-235 abundance, shown in Table 5a, ranges from 4.9% to 14% of U-238 activity, which is elevated above the expected 4.6% ratio. This perceived enrichment is due to the alpha spectrometer's inability to differentiate between U-238, U-235 and U-234 in the spectral regions where their alpha energies are similar. Because of the alpha spectroscopy method's inability to measure U-235 content accurately, uranium fuel fabrication facilities and DOE uranium enrichment facilities analyze for U-235 using mass spectroscopy.

U-238 and U-234 Analysis

The analytical laboratory, Quanterra (Earth City, MO), was instructed by Kerr-McGee to maximize the quality of the U-234 and U-238 data; thus, by necessity, the quality of the U-235 data was compromised. But this did not compromise the ability to judge whether enriched uranium is somehow present at the site.

Whenever uranium is enriched, it is enriched in U-234 greater than in U-235. Whenever uranium is depleted, it is depleted in U-234 greater than in U-235. Whenever the activity ratio of U-234 to U-238 $\approx$ 1 the uranium is neither enriched nor depleted; the uranium is natural. (Or, said another way, in natural uranium the U-234 is in secular equilibrium with its parent, U-238.) This relationship explains why Quanterra was instructed to maximize the U-234 and U-238 data quality. If the activity of U-238 was found to equal the activity of U-234 then the uranium must be natural.

The results in Table 5a show that the activity of U-234 $\approx$ U-238, with a U-234:U-238 ratio ranging from 0.94 to 1.08. Therefore, the uranium must be natural (the uranium nuclides or isotopes are at natural abundance). The comparison of the U-238 and U-234 data thus confirms that the apparent excess of U-235 is the result of the expected counting problems in measuring U-235.

Uncertainties

The uncertainties provided in Table 5a are two standard deviations of the count-rate, as specified in US-NRC Reg. Guide 4.14. The reader is cautioned not to attribute these counting uncertainties as the uncertainty in the analysis. That is, the error bounds do not reflect 95%

[2/] Alpha Spectrometer system energy resolutions typically range from 0.02 to 0.12 MeV. The resolution obtained varies from sample to sample within the range.

confidence limits of the actual concentrations in the samples. Thus, it is incorrect to use the lower bound for U-235 and the upper bound for U-238/234 in assessing the lower limit of relative U-235 concentration.

THORIUM Table 6

The thorium nuclides, or isotopes, are in their natural, "aged" ratios.

Th-232 and Th-228 Analysis

Because thorium processing at the Lindsay Light II Site ceased around 60 years ago, the thorium residuals will be in secular equilibrium in the soils at the Site.[3/] Thorium is considered to be in secular equilibrium when the activity of Th-228 ≈ Th-232. The results provided in Table 6 show that the activity of the Th-228 = Th-232 when the uncertainty in the count-rate is taken into account. That is, for each and every sample in Table 6, when a portion of the uncertainty is added to (or subtracted from) the Th-228 and a portion of the uncertainty is subtracted from (or added to) the Th-232, the resulting activity ratio (Th-232/Th-228) is exactly 1. This demonstrates that the thorium is in secular equilibrium.

For example, take sample CD-S78E18N-2-3. The Th-228 is reported to be 342 ± 52.9 pCi/g and the Th-232 is reported to be 399 ± 58.8 pCi/g. When only 54% of the uncertainty is added to the Th-228 value of 342 (+ 28.5) and only 48% of the uncertainty is subtracted from the Th-232 value of 399 (- 28.5) we have Th-228 = 370.5 pCi/g and Th-232 = 370.5 pCi/g; the activity ratio of Th-232/Th-228 is exactly 1. Therefore, the thorium measurements in this sample reflect secular equilibrium.

Th-230 Analysis

The reader should note that Th-230 is a daughter of U-238 (specifically the daughter of U-234) and is unrelated to the Th-228:Th-232 ratio.

Garet E. Van De Steeg

3/ Thorium-232 and progeny achieve secular equilibrium within 58 years.